

Chemistry Equations Revision

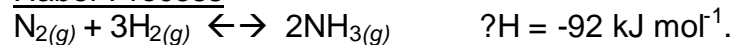
Production of Materials	
Bromine Water Experiment	<p><u>Formation of Bromine Water:</u> $\text{Br}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{HOBr}(\text{aq}) + \text{Br}^-(\text{aq}) + \text{H}^+(\text{aq})$</p> <p><u>Reaction:</u> $\text{C}_6\text{H}_{12}(\text{l}) + \text{HOBr}(\text{aq}) \longrightarrow \text{C}_6\text{H}_{12}\text{BrOH}(\text{aq})$</p>
Dehydration of Ethylene	$\text{CH}_3\text{CH}_2\text{OH}(\text{g}) \xrightarrow{\text{H}_2\text{SO}_4 \text{ catalyst}} \text{C}_2\text{H}_4(\text{g}) + \text{H}_2\text{O}(\text{l})$
Addition of Water to Ethylene	$\text{C}_2\text{H}_4(\text{g}) + \text{H}_2\text{O}(\text{l}) \xrightarrow{\text{dilute H}_2\text{SO}_4} \text{CH}_3\text{CH}_2\text{OH}(\text{g})$
Combustion of Ethanol	$\text{C}_2\text{H}_5\text{OH}(\text{l}) + 3\text{O}_2(\text{g}) \longrightarrow 2\text{CO}_2(\text{g}) + 3\text{H}_2\text{O}(\text{g}) + \text{Heat}$
Fermentation of Glucose	$\text{C}_6\text{H}_{12}\text{O}_6(\text{aq}) \xrightarrow{\text{yeast}} 2\text{C}_2\text{H}_6\text{O}(\text{aq}) + 2\text{CO}_2(\text{g}) + \text{Heat}$
Dry Cell Half-Equations	<p><u>At the Anode:</u> $\text{Zn}(\text{s}) \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{e}^-$</p> <p><u>At the Cathode:</u> $\text{NH}_4^+(\text{aq}) + \text{MnO}_2(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{Mn}(\text{OH})_3(\text{s}) + \text{NH}_3(\text{aq})$</p>

Lithium Cell Half-Equations	
	<p><u>At the Anode:</u> $\text{Li}(s) \rightarrow \text{Li}^+(\text{soln}) + e^-$</p> <p><u>At the Cathode:</u> $\text{Mn}^{\text{IV}}\text{O}_2(s) + \text{Li}^+(\text{soln}) + e^- \rightarrow \text{LiMn}^{\text{III}}\text{O}_2(s) \quad (\text{Li}^+\text{Mn}^{\text{III}}\text{O}_2)$</p>
<u>The Acidic Environment:</u>	
Acid Reaction Rules	
	<p>Acid + Base \rightarrow Salt + Water Acid + Metal \rightarrow Salt + Hydrogen gas Acid + Carbonate \rightarrow Salt + Water + Carbon dioxide gas</p>
Reaction between carbon dioxide and water	
	<p><u>Formation of Carbonic Acid:</u> $\text{CO}_2(g) + \text{H}_2\text{O}(l) \rightleftharpoons \text{H}_2\text{CO}_3(aq) \quad (\text{Carbonic Acid})$</p>
Causes of Sulfur Dioxide	
	<p><u>Bacterial Decomposition:</u> $2\text{H}_2\text{S}(g) + 3\text{O}_2(g) \longrightarrow 2\text{SO}_2(g) + 2\text{H}_2\text{O}(l)$</p> <p><u>Combustion of Fossil Fuels:</u> $4\text{FeS}_2(s) + 11\text{O}_2(g) \longrightarrow 2\text{Fe}_2\text{O}_3(s) + 8\text{SO}_2(g)$</p> <p><u>Smelting of Sulfide Ores:</u> $2\text{ZnS}(s) + 3\text{O}_2(g) \longrightarrow 2\text{ZnO}(s) + 2\text{SO}_2(g)$</p>
Causes of oxides of nitrogen	
	<p><u>Lightning:</u> $\text{N}_2(g) + \text{O}_2(g) \longrightarrow 2\text{NO}(g)$</p>

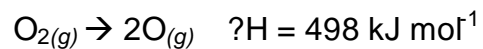
	<p><u>Sunlight:</u> $2\text{NO}(g) + \text{O}_2(g) \longrightarrow 2\text{NO}_2(g)$</p> <p><u>Combustion of Fossil Fuels:</u> $\text{N}_2(g) + \text{O}_2(g) \xrightarrow{\text{High Temp}} 2\text{NO}$</p> $\text{NO}_2(g) + \text{H}_2\text{O} \longrightarrow \text{H}_2\text{NO}_3$
Formation of Acid Rain	
	$2\text{NO}_2(g) + \text{H}_2\text{O}(l) \longrightarrow \text{HNO}_2 + \text{HNO}_3$ $\text{SO}_2(g) + \text{H}_2\text{O}(l) \longrightarrow \text{H}_2\text{SO}_3(aq)$ $\text{SO}_3(g) + \text{H}_2\text{O}(l) \longrightarrow \text{H}_2\text{SO}_4(aq)$
Ionisation of HCl	
	$\text{HCl} + \text{H}_2\text{O} \longrightarrow \text{Cl}^- + \text{H}_3\text{O}^+$
Ionisation of Citric Acid	
	$\text{C}_6\text{H}_8\text{O}_7 + \text{H}_2\text{O} \longleftrightarrow \text{C}_6\text{H}_7\text{O}_7^- + \text{H}_3\text{O}^+$ $\text{C}_6\text{H}_7\text{O}_7^- + \text{H}_2\text{O} \longleftrightarrow \text{C}_6\text{H}_6\text{O}_7^{2-} + \text{H}_3\text{O}^+$ $\text{C}_6\text{H}_6\text{O}_7^{2-} + \text{H}_2\text{O} \longleftrightarrow \text{C}_6\text{H}_5\text{O}_7^{3-} + \text{H}_3\text{O}^+$
Ionisation of Acetic Acid	
	$\text{CH}_3\text{COOH} + \text{H}_2\text{O} \longleftrightarrow \text{CH}_3\text{COO}^- + \text{H}_3\text{O}^+$

Chemical Monitoring & Management

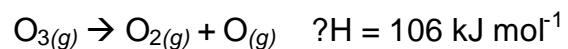
Production of Ammonia

Haber Process

Breaking of oxygen double bond



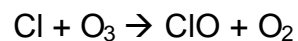
Breaking of ozone bond



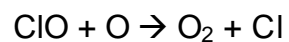
Breaking Down of CFC's



Destruction of Ozone

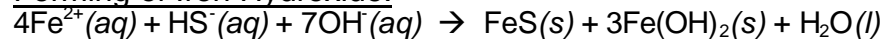


Final Stage of Ozone Depletion:



Shipwrecks	
Passivating Metal	
	<u>Aluminium:</u> $4\text{Al}_{(s)} + 3\text{O}_{2(g)} \rightarrow 2\text{Al}_2\text{O}_{3(s)}$
Process of Rusting:	
	<u>At the Anode:</u> $\text{Fe}_{(s)} \rightarrow \text{Fe}^{2+}_{(aq)} + 2\text{e}^-$ <u>At the Cathode:</u> $\text{O}_{2(g)} + 2\text{H}_2\text{O}_{(l)} + 4\text{e}^- \rightarrow 4\text{OH}^-_{(aq)}$ <u>Two combined:</u> $\text{Fe}^{2+}_{(aq)} + 2\text{OH}^-_{(aq)} \rightarrow \text{Fe}(\text{OH})_2(s)$ <u>Oxidation of Iron(II) hydroxide:</u> $4\text{Fe}(\text{OH})_2(s) + \text{O}_{2(g)} \rightarrow 2(\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O})(s) + 2\text{H}_2\text{O}_{(l)}$
Galvanising	
	$\text{Zn}^{2+} + 2\text{OH}^- \rightarrow \text{Zn}(\text{OH})_2(s)$ $\text{Zn}_{(s)} + \text{Fe}^{2+}_{(aq)} \rightarrow \text{Zn}^{2+} + \text{Fe}_{(s)}$
Bacterial Corrosion	
	<u>Reduction of Sulfate:</u> $\text{SO}_4^{2-}_{(aq)} + 5\text{H}_2\text{O}_{(l)} + 8\text{e}^- \rightarrow \text{HS}^-_{(aq)} + 9\text{OH}^-_{(aq)}$ <u>At the Anode:</u> $4\text{Fe}_{(s)} \rightarrow 4\text{Fe}^{2+}_{(aq)} + 8\text{e}^-$ <u>Overall Equation:</u> $4\text{Fe}_{(s)} + \text{SO}_4^{2-}_{(aq)} + 5\text{H}_2\text{O}_{(l)} \rightarrow 4\text{Fe}^{2+}_{(aq)} + \text{HS}^-_{(aq)} + 9\text{OH}^-_{(aq)}$

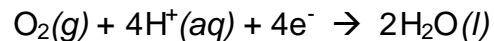
Forming of Iron Hydroxide:



Overall Process:

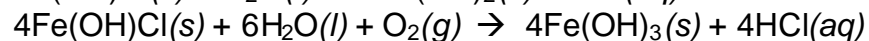
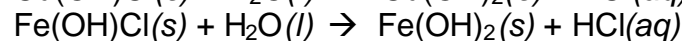
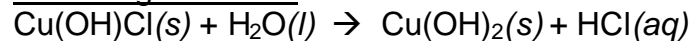


Rust in acidic environments



Insoluble Hydroxy Chlorides:

The Danger of them:



Removal of them by electrolysis:

At the Cathode:



&



At the Anode:

